

## DETAILED ACTION

Claims 1-21 are cancelled and claims 22-44 are pending for examination.

### *Drawings*

1. The drawings are objected to because of spelling errors. For example, in Fig. 3 item 1002 and Fig. 7 item 3002, "interfeaence" should be replaced with "interference". Fig. 8 item 4001 "modulation" should be replaced with "modulation". Fig. 9 item 5004 "transmitng" should be replaced with "transmitting". Fig. 10 item 7007 "perfon" should be replaced with "perform". Fig. 15 item 8001 "democulation" should be replaced with "demodulation", item 8005 "contination" should be replaced with "combination", and item 8006 "oftained" should be replaced with "obtained". Corrected drawing sheets in compliance with 37 CFR 1.121(d) are required in reply to the Office action to avoid abandonment of the application. Any amended replacement drawing sheet should include all of the figures appearing on the immediate prior version of the sheet, even if only one figure is being amended. The figure or figure number of an amended drawing should not be labeled as "amended." If a drawing figure is to be canceled, the appropriate figure must be removed from the replacement sheet, and where necessary, the remaining figures must be renumbered and appropriate changes made to the brief description of the several views of the drawings for consistency. Additional replacement sheets may be necessary to show the renumbering of the remaining figures. Each drawing sheet submitted after the filing date of an application must be labeled in the top

margin as either "Replacement Sheet" or "New Sheet" pursuant to 37 CFR 1.121(d). If the changes are not accepted by the examiner, the applicant will be notified and informed of any required corrective action in the next Office action. The objection to the drawings will not be held in abeyance.

***Specification***

2. The disclosure is objected to because of the following informalities: page 16 lines 9-14, it is unclear to examiner the meaning of "the number of multiple values of modulation". It is also unclear what values the following sentence refers to "modulation mode setting units 118 and 123 are set to those values."

Appropriate clarification is required.

***Claim Rejections - 35 USC § 112***

3. Claims 30 and 31 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. In the claims, specification and drawings of the application, "the number of multiple values of modulation and demodulation" is used many times but applicant failed to explain the exact meaning of it. The examiner cannot establish the meaning of "the number of multiple values of modulation and demodulation" from the application and therefore reject the claims as being indefinite.

***Claim Rejections - 35 USC § 102***

Art Unit: 2618

4. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

5. Claims 22-26, 28, 30-33, 38-39, 41-44 are rejected under 35 U.S.C. 102(b) as being anticipated by **van Nee (US 6175550)**, as cited in applicant's IDS.

Regarding claim 22, van Nee discloses a radio communications device comprising:

a transmitter (**Fig. 1, item 11 and Fig. 5, item 10**) comprising:

a plurality of transmission antennas for radiating radio waves based on transmission RF signals (**Fig. 5, item 78**);

a plurality of transmitting circuit means for supplying the transmission RF signals to said transmission antennas, respectively, based on a plurality of transmission signals; and transmission signal processing means having modulating means, for modulating input transmission data to generate said transmission signals by using said modulating means, and for outputting the transmission signals to said transmitting circuit means (**Fig. 1, item 14, 16 and 22 performing coding, modulation and transmitting data through antenna 24**);

a receiver (**Fig. 4, item 31 and Fig. 5, item 30**) comprising:

a plurality of reception antennas for receiving radio waves from a transmitter and outputting reception RF signals (**Fig. 5, item 78**);

a plurality of receiving circuit means for outputting reception signals based on said reception RF signals input respectively from said reception antennas; and

Art Unit: 2618

reception signal processing means having demodulating means, for demodulating the reception signals output respectively from said receiving circuit means by using said demodulating means, and for generating reception data (**Fig. 4, item 34, 46 and 47 receiving signals, demodulating and outputting signals**);

propagation detecting means for detecting a propagating state of said radio waves (**Fig. 4, item 40 detecting signals**);

and

symbol rate setting means for selecting a symbol rate to be used from a plurality of symbol rates based on the detected propagating state, and for setting the selected symbol rate in said modulating means and said demodulating means (**Fig. 4, item 47 rate control/setting means; and col. 1 lines 37-61 dynamically changing symbol duration, therefore symbol rate, according to desired performance. Note that symbol rate is defined as 1/symbol duration**).

Regarding claim 23, van Nee discloses a radio communications device comprising:

a transmitter (**Fig. 1, item 11 and Fig. 5, 10**) comprising:

a plurality of transmission antennas for radiating radio waves based on transmission RF signals (**Fig. 5, item 78**);

a plurality of transmitting circuit means for supplying the transmission RF signals to said transmission antennas, respectively, based on a plurality of transmission signals; and transmission signal processing means having a plurality of modulating means having respective different symbol rates, for modulating input transmission data to generate

Art Unit: 2618

said transmission signals by using a selected one of said modulating means, and for outputting the transmission signals to said transmitting circuit means (**Fig. 1, item 14, 16, 18, 20, 22 and col. 1 lines 37-61**);

a receiver (**Fig. 4, item 31 and Fig. 5, item 30**) comprising:

a plurality of reception antennas for receiving the radio waves from a transmitter and outputting reception RF signals (**Fig. 5, item 78**);

a plurality of receiving circuit means for outputting reception signals based on said reception RF signals input respectively from said reception antennas; and  
reception signal processing means having a plurality of demodulating means having respective different symbol rates, for demodulating the reception signals input respectively from said receiving circuit means by using a selected one of said demodulating means, and for generating reception data(**Fig. 4, item 34, 36, 38, 40, 42, 44, 46, 48, 50 and 52; and col. 1 line 62-col. 2 line 10**);

propagation detecting means for detecting a propagating state of said radio waves (**Fig. 4, item 40**);

and

modulating means/demodulating means selecting means for selecting one of said modulating means and one of said demodulating means based on the detected propagating state (**col. 1 line 62-col. 2 line 10, col. 4 lines 4-17 modulating means, and col. 7 lines 35-39 demodulating**).

Regarding claim 24, van Nee discloses the radio communications device according to claim 22, wherein said propagation detecting means detects the propagating state of said radio waves according to at least one of the following: the level of a reception electric power, a transmission error rate, a retransmission rate, or a channel matrix estimated in a spatial multiplexing process (**Fig. 4, item 40 detecting means, and col. 2 line 51-col. 3 lines 13-21 signal-to-noise ratio, therefore level of reception power**).

Regarding claim 25, van Nee discloses the radio communications device according to claim 23, wherein said propagation detecting means detects the propagating state of said radio waves according to at least one of the following: the level of a reception electric power, a transmission error rate, a retransmission rate, or a channel matrix estimated in a spatial multiplexing process (**Fig. 4, item 40 and col. 2 line 51-col. 3 lines 13-21 signal-to-noise ratio, therefore level of reception power**).

Regarding claim 26, van Nee discloses the radio communications device according to claim 22, further comprising control means for instructing said symbol rate setting means to set a high symbol rate or a low symbol rate in said modulating means and said demodulating means based on the propagating state of said radio waves as detected by said propagation detecting means (**Fig. 1, item 15 and Fig. 4, 47; and col. 2 line 51-col. 3 lines 13-21**).

Regarding claim 28, van Nee discloses the radio communications device according to claim 23, further comprising control means for instructing said modulating means/demodulating means selecting means to select modulating means and demodulating means which have a high symbol rate or to select modulating means and demodulating means which have a low symbol rate based on the propagating state of said radio waves as detected by said propagation detecting means (**col. 1 lines 36-col. 2 line 29**).

Regarding claim 30, van Nee discloses the radio communications device according to claim 26 or 27, further comprising means for lowering the number of multiple values of modulation and demodulation in said modulating means and said demodulating means when said high symbol rate is set, and for increasing the number of multiple values of modulation and demodulation in said modulating means and said demodulating means when said low symbol rate is set (**col. 3 lines 34-52**).

Regarding claim 31, van Nee discloses the radio communications device according to claim 28 or 29, further comprising means for lowering the number of multiple values of modulation and demodulation in said modulating means and said demodulating means when said high symbol rate is selected, and for increasing the number of multiple values of modulation and demodulation in said modulating means and said demodulating means when said low symbol rate is selected (**col. 3 lines 34-52**).

Art Unit: 2618

Regarding claim 32, van Nee discloses the radio communications device according to claim 26 or 27, wherein said transmission signal processing means and said reception signal processing means reduce the number of said transmitting circuit means to be used and the number of said receiving circuit means to be used when said high symbol rate is set, and increase the number of said transmitting circuit means to be used and the number of said receiving circuit means to be used when said low symbol rate is set **(col. 1 line 62-col.2 line 10; and col. 3 lines 34-58, changing number of carriers/transmitting circuit means due to detected conditions for desired performance).**

Regarding claim 33, van Nee discloses the radio communications device according to claim 28 or 29, wherein said transmission signal processing means and said reception signal processing means reduce the number of said transmitting circuit means to be used and the number of said receiving circuit means to be used when said high symbol rate is selected, and increase the number of said transmitting circuit means to be used and the number of said receiving circuit means to be used when said low symbol rate is selected **(col. 1 line 62-col.2 line 10; and col. 3 lines 34-58, changing number of carriers/transmitting circuit means due to detected conditions for desired performance).**

Regarding claim 38, van Nee discloses the radio communications device according to claim 32, further comprising power supply control means for controlling power supplies



Art Unit: 2618

of said plurality of transmitting circuit means and said plurality of receiving circuit means, respectively, to stop supplying electric power to the transmitting circuit means and the receiving circuit means which are not in use **(col. 2 line 62-col. 3 line 10, dynamically scale the number of carriers/transmitting circuit means and therefore stop supplying power to the ones that are not transmitting signals).**

Regarding claim 39, van Nee discloses the radio communications device according to claim 22, wherein said transmission antennas and said reception antennas are shared **(col. 2 lines 19-29).**

Regarding claim 41, van Nee discloses a radio transmitter comprising:

a plurality of transmission antennas for radiating radio waves based on transmission RF signals **(Fig. 5, item 78);**

a plurality of transmitting circuit means for supplying the transmission RF signals to said transmission antennas, respectively, based on a plurality of transmission signals; transmission signal processing means having modulating means, for modulating input transmission data to generate said transmission signals by using said modulating means, and for outputting the transmission signals to said transmitting circuit means **(Fig. 1, item 11 and col. 1 lines 37-col. 2. line 29);** and

symbol rate setting means for selecting a symbol rate to be used from a plurality of symbol rates based on a detected propagating state of said radio waves, and for setting the selected symbol rate in said modulating means **(Fig. 1, item 15; and col. 3 lines**

**34-52).**

Regarding claim 42, van Nee discloses a radio receiver comprising:

a plurality of reception antennas for receiving radio waves from a transmitter and outputting reception RF signals (**Fig. 5, item 78**);

a plurality of receiving circuit means for outputting reception signals based on said reception RF signals input respectively from said reception antennas (**Fig 4, item 31**);

reception signal processing means having demodulating means, for demodulating the reception signals output respectively from said receiving circuit means by using said demodulating means, and for generating reception data (**Fig. 4, item 52**); and

symbol rate setting means for selecting a symbol rate to be used from a plurality of symbol rates based on a detected propagating state of said radio waves, and for setting the selected symbol rate in said demodulating means (**Fig. 4, item 47 dynamic rate control to set the rates**);.

Regarding claim 43, van Nee discloses a radio transmitter comprising:

a plurality of transmission antennas for radiating radio waves based on transmission RF signals (**Fig. 5, item 78**);

a plurality of transmitting circuit means for supplying the transmission RF signals to said transmission antennas, respectively, based on a plurality of transmission signals;

transmission signal processing means having a plurality of modulating means having respective different symbol rates, for modulating input transmission data to generate

Art Unit: 2618

said transmission signals by using a selected one of said modulating means, and for outputting the transmission signals to said transmitting circuit means (**Fig. 1, item 11; and col. 1 lines 37-col 2. line 29**); and

modulating means selecting means for selecting one of said modulating means to be used based on a detected propagating state of said radio waves (**col. 3 lines 22-52**).

Regarding claim 44, van Nee discloses a radio receiver comprising:

a plurality of reception antennas for receiving radio waves and outputting reception RF signals (**Fig. 5, item 78**);

a plurality of receiving circuit means for outputting reception signals based on said reception RF signals input respectively from said reception antennas (**Fig. 4, item 31; and col. 2 lines 11-29**); and

reception signal processing means having a plurality of demodulating means having respective different symbol rates, for demodulating the reception signals input respectively from said receiving circuit means by using a selected one of said demodulating means, and for generating reception data (**Fig. 4, item 52; and col. 7 lines 35-39**); and

demodulating means selecting means for selecting one of said demodulating means to be used based on a detected propagating state of said radio waves (**col. 7 lines 35-39**).

***Claim Rejections - 35 USC § 103***

6. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

7. Claims 27, 29 and 34 are rejected under 35 U.S.C. 103(a) as being unpatentable over van Nee in view of **Smith et al. (US 7315563)**, herein referred as Smith.

Regarding claim 27, van Nee discloses the radio communications device according to claim 26, wherein said control means to change transmission rate based on propagating state of said radio waves detected by said propagation detecting means (**col. 2 line 50-col. 3 line 20; and col. 3 line 38-43**). However, van Nee fails to disclose the radio communications device wherein said control means to determine the intensity of multipath interference from the propagating state of said radio waves as detected by said propagation detecting means, instructs said symbol rate setting means to set a high symbol rate in said modulating means and said demodulating means when it is determined that multipath interference is weak, and instructs said symbol rate setting means to set a low symbol rate in said modulating means and said demodulating means when it is determined that multipath interference is strong. **Smith** teaches a communication system in which the modulating means employ higher symbol rates when the mobile link is an isolated clear point-to-point path which is subject to low multipath, and opt for lower symbol rates (longer symbol periods) when the mobile link

is subject to high multipath interference to combat the higher delay spread encountered in the mobile environment **(col. 8 lines 18-40)**. Therefore, it would have been obvious to a person having ordinary skill in the art at the time the invention was made to incorporate the communication system taught by Smith into the communication device disclosed by van Nee in order to enhance the communication device in a controlled manner to render the signal very difficult to intercept or interfere **(col. 8 lines 18-40)**.

Regarding claim 29, van Nee discloses the radio communications device according to claim 28, wherein said control means to change transmission rate based on propagating state of said radio waves detected by said propagation detecting means **(col. 2 line 50-col. 3 line 20; and col.3 line 38-43)**. However, van Nee fails to disclose the radio communications device wherein said control means to determine the intensity of multipath interference from the propagating state of said radio waves as detected by said propagation detecting means, instructs said symbol rate setting means to set a high symbol rate in said modulating means and said demodulating means when it is determined that multipath interference is weak, and instructs said symbol rate setting means to set a low symbol rate in said modulating means and said demodulating means when it is determined that multipath interference is strong. **Smith** teaches a communication system in which the modulating means employ higher symbol rates when the mobile link is an isolated clear point-to-point path which is subject to low multipath, and opt for lower symbol rates (longer symbol periods) when the mobile link is subject to high multipath interference to combat the higher delay spread encountered

in the mobile environment (**col. 8 lines 18-40**). Therefore, it would have been obvious to a person having ordinary skill in the art at the time the invention was made to incorporate the communication system taught by Smith into the communication device disclosed by van Nee in order to enhance the communication device in a controlled manner to render the signal very difficult to intercept or interfere (**col. 8 lines 18-40**).

Regarding claim 34, van Nee discloses the radio communications device according to claim 27 or 29, wherein said control means instructs said transmission signal processing means and said reception signal processing means to use one of said plurality of transmitting circuit means and one of said plurality of receiving circuit means, respectively based on detected conditions in order to achieve certain desired performance (**col. 2 line 50-col. 3 lines 2**). However, van Nee fails to disclose the radio communications device wherein said control means instructs said transmission signal processing means and said reception signal processing means to use one of said plurality of transmitting circuit means and one of said plurality of receiving circuit means, respectively, when it is determined that multipath interference is weak, and instructs said transmission signal processing means and said reception signal processing means to use said plurality of transmitting circuit means and said plurality of receiving circuit means, respectively, when it is determined that multipath interference is strong. **Smith** teaches a communication system in which the control means instruct signal processing means employ higher symbol rates when the mobile link is an isolated clear point-to-point path which is subject to low multipath, and opt for lower symbol rates (longer

symbol periods) when the mobile link is subject to high multipath interference to combat the higher delay spread encountered in the mobile environment (**col. 8 lines 18-40**).

Therefore, it would have been obvious to a person having ordinary skill in the art at the time the invention was made to incorporate the communication system taught by Smith into the communication device disclosed by van Nee in order to enhance the communication device in a controlled manner to render the signal very difficult to intercept or interfere (**col. 8 lines 18-40**).

Claims 35 and 36 are rejected under 35 U.S.C. 103(a) as being unpatentable over van Nee in view of **Kung et al. (US 2006/0141952)**, herein referred as Kung.

Regarding claim 35, van Nee discloses the radio communications device according to claim 22 or 23, wherein said demodulating means has demodulation modes processing the demodulated reception signals to generate said reception data, said radio communications device further comprising modulation/demodulation mode selecting means for selecting and setting said modulation modes and said demodulation modes (**col. 3 lines 22-47 and col. 7 lines 35-39**).

van Nee fails to disclose said modulating means has modulation modes including a direct modulation mode for directly modulating said transmission data into a transmission carrier and an indirect modulation mode for modulating said transmission data into a transmission carrier after the transmission data are processed. **Kung** teaches a multi-mode modulator/demodulator which has direct modulation and indirect

modulation in a communication transmitter **([0027])**. Indirect modulation/demodulation has the advantage of high overall performance in terms of noise, linearity and power/gain control **([0080])**. Direct modulation/demodulation has the advantages of simplified frequency planning, low cost implementation and compatibility with multiple modulation formats **([0040])**. Therefore, it would have been obvious to a person having ordinary skill in the art at the time the invention was made to incorporate the modulation/demodulation techniques taught by Kung into the radio communication device disclosed by van Nee in order to take advantage of both direct modulation/demodulation and indirect modulation/demodulation.

Regarding claim 36, van Nee discloses the radio communications device according to claim 35, wherein said control means instructs said modulating means and said demodulating means to change according to detected signal condition such as impairments due to multipath **(col. 3 lines 22-52)**. However van Nee fails to disclose said control means instructs said modulating means and demodulating means to use said direct modulation mode and said direct demodulation mode, respectively, when it is determined that multipath interference is weak, and instructs said modulating means and said demodulating means to use said indirect modulation mode and said indirect demodulation mode, respectively, when it is determined that multipath interference is strong. **Kung** teaches a multi-mode modulator/demodulator which has direct modulation and indirect modulation in a communication transmitter **([0027])**. Indirect modulation/demodulation has the advantage of high overall performance in terms of



noise, linearity and power/gain control ([0080]). Direct modulation/demodulation has the advantages of simplified frequency planning, low cost implementation and compatibility with multiple modulation formats ([0040]). Therefore, it would have been obvious to a person having ordinary skill in the art at the time the invention was made to incorporate the modulation/demodulation techniques taught by Kung into the radio communication device disclosed by van Nee in order to take advantage of using direct modulation/demodulation for its power efficiency ([0040]) when there is a weak interference and the power level is not required to be high; and using indirect modulation/demodulation for its better performance in terms of noise and better gain control capability ([0027]) to enhance the signal when there is a strong interference.

Both van Nee and Kung disclose switching between direct modulation mode and indirect modulation based on interference levels. But they fail to explicitly disclose the interference is multipath interference. It is common knowledge that multipath interference is one of the major interference sources in wireless communication. Therefore, it would have been obvious to a person having ordinary skill in the art at the time the invention was made to incorporate multipath interference into generic signal degradation sources in order to more effectively address the biggest signal degradation problem.

Claim 37 is rejected under 35 U.S.C. 103(a) as being unpatentable over **van Nee**.

Regarding claim 37, van Nee discloses the radio communications device according to claim 34, wherein said control means instructs said modulating means and said demodulating means to select any one of modulating and demodulating processes including ASK, BPSK, FSK, QPSK, and DQPSK and to use one of said plurality of transmitting circuit means and one of said plurality of receiving circuit means, respectively, when it is determined that the interference is weak (noise is low from SNR), and instructs said modulating means and said demodulating means to select either of modulating and demodulating processes including multivalued PSK and multivalued QAM and to use said plurality of transmitting circuit means and said plurality of receiving circuit means, respectively, when it is determined that the interference is strong (noise is high from SNR) (**col. 3 lines 34-52 and col. 4 lines 31-43**).

But van Nee fails to explicitly disclose the multipath interference level is used as a benchmark to adjust modulation schemes. It is common knowledge that multipath interference is one of the major signal degradation sources in wireless communication. Therefore, it would have been obvious to a person having ordinary skill in the art at the time the invention was made to use multipath interference level as a benchmark to adjust modulation schemes in order to more effectively address the biggest signal degradation problem.

Claim 40 is rejected under 35 U.S.C. 103(a) as being unpatentable over van Nee in view of **Borean et al. (US 2006/0206552)**, herein referred as Borean.

Regarding claim 40, van Nee discloses the radio communications device according to any of claims 22, 27 and 29 but fails to disclose said radio waves have a frequency of 10 GHz or higher. Borean teaches an OFDM transmitter using millimeter-wave carriers with carrier frequencies ranging between 40-60 GHz ([0007]). The use of millimeter-wave carriers makes it possible to allocate to the users a much larger frequency band in comparison with standard WLAN systems ([0007]). Therefore, it would have been obvious to a person having ordinary skill in the art at the time the invention was made to incorporate the high carrier frequency taught by Borean into the radio communication device disclosed by van Nee in order to take advantage of using millimeter-wave carriers to obtain larger frequency band to the users ([0007]).

### ***Conclusion***

8. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

**Jorswieck et al. (US 2006/0193294)** discloses a MIMO signal processing method involving a rank-adaptive matching of the transmission rate.

**Shin et al. (US 2005/0141472)** discloses an apparatus and method for compensating forward link rain attenuation based on adaptive transmission scheme for interactive satellite transmission system.

9. Any inquiry concerning this communication or earlier communications from the examiner should be directed to KATHY WANG-HURST whose telephone number is

Art Unit: 2618

(571)270-5371. The examiner can normally be reached on Monday-Thursday, 7:30am-5pm, alternate Fridays, EST.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Benny Tieu can be reached on (571)272-7490. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

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